BINDER BASED ON STARCH

The invention relates to a method for producing a mixture of grainy to powdery materials containing a starch, a first component, containing at least one starch being mixed in an extruder with a second component containing at least water.

Binders, based on starch, are used in numerous food products and for technical applications. For this purpose, the dry, powdery binder substance is usually stirred into water and subsequently mixed and processed further with other, usually solid materials. For the further processing to an end product, a portion of the water is withdrawn once again from this mixture of solids and binder.

It is an object of the invention to make available a starch-containing dry binder substance, which can be stirred into water in order to obtain a homogeneous, liquid binder having a total concentration of 1-10% of dry substance. This binder should, for example, have a low viscosity of about 40 mPs to 80 mPs at a concentration of approximately 6% of dry substance.

This objective is accomplished for the method described above owing to the fact that:

a) the total water content of the mixture, containing the first component and the second component, is less than 40% by weight and, in particular, ranges from 15% to 20%,

b) the temperature during the mixing and cooking processes in the extruder is between 120° and 250°C and preferably ranges from 160° to 220°C,

c) the extrudate, obtained in the extruder, is dried and

d) the dried extrudate is ground and screened.

Due to the relatively high temperatures during the mixing and cooking processes, there is much evaporation from the extrudate after it leaves the extruder, so that there is no need for additional, energy-intensive measures for drying the extrudate. Accordingly, the extrudate is dried extensively only by being cooled under normal room conditions. The relatively high temperatures also lead to a better solubility of the dry binder product.

Preferably, the maximum screen size during screening is 4 mm and especially 1 mm to 3 mm.

Because of the inventive extrusion conditions, such a coarse screen size is adequate for achieving a granulation, which makes optimum suspension of the products possible. In addition, the technical effort, the energy consumption and the wear of the grinding devices for such a coarse grinding is much less than in the case of fine grinding.

Furthermore, the coarser screens, required in conjunction with the inventive coarse grinding, are cheaper and, because of the fines portion contained in the material ground, tend to clog less than do fine screens.

Advisably, the initial water content of the first component is about 10 to 10 to 15% by weight. Additional water is added to the extruder during the mixing process.

Preferably, an acid and/or an alkali are added during the mixing to the mixture containing the starch and water. The viscosity, as well as the color of the binder and, with that, also of the end product, can be affected by such a change in the pH.

The starch-containing component may be flour, especially rye flour. For example, conventional, commercial rye flour with initial water content of about 10 to 15% by weight is advantageous.

The inventive mixing process takes place preferably in a twin-screw extruder, rotating in the same direction at 200 to 1200 rpm, the specific mechanical energy input being, in particular, 120 to 220 Wh/kg.

The inventive, starch-containing, grainy to powdery mixture of materials can be used as binder, the starch-containing mixture of materials being stirred into water for this

purpose. Preferred water temperatures range here from 20° to 70°C and particularly from 30° to 60°C.

The starch-containing mixture of materials proves to be especially advantageous as a binder for cellulose fibers, especially for the production of paper or cardboard.

Further advantageous distinguishing features and possible applications of the inventive method arise out of the following example.

Example

Conventional, commercial rye flour is transferred to a twin-screw extruder rotating in the same direction. The total water content in the extruder is then increased to 20% by weight. The extrusion temperature is of the order of 190°C. The twin-screw extruder is operated at about 600 rpm and produces a specific mechanical energy input of approximately 160 - 200 Wh/kg. The extrudate, emerging from the twin-screw extruder, dries in air without any special drying effort, because its temperature has been raised sufficiently in the extruder and a sufficient amount of water is evaporated due to the reduction in pressure as the extrudate leaves the extruder. The dry extrudate, so obtained, is subjected to a coarse milling and a coarse classification.

The grainy, dry binder product, so obtained, has excellent water solubility and can be dispersed in water without forming lumps, so that a homogeneous, liquid binder with a concentration of 5 to 10% can be produced.

The liquid binder prepared is used, for example, for the production of paper or cardboard, in order to improve their properties. For this purpose, paper sheets are "drawn" through the inventive suspension, wetting and at least partial penetration of the paper sheet being achieved because of the viscosity, which has been adjusted pursuant to the invention, and because of the homogeneity of the binder, which has been achieved (" surface gluing").